C. WHITE.

METHOD OF OPERATING GAS ENGINES AND APPARATUS THEREFOR.

APPLICATION FILED JUNE 24, 1909. RENEWED MAY 11, 1910.

**975,008.** Patented Nov. 8, 1910.

*Fig. 1.*

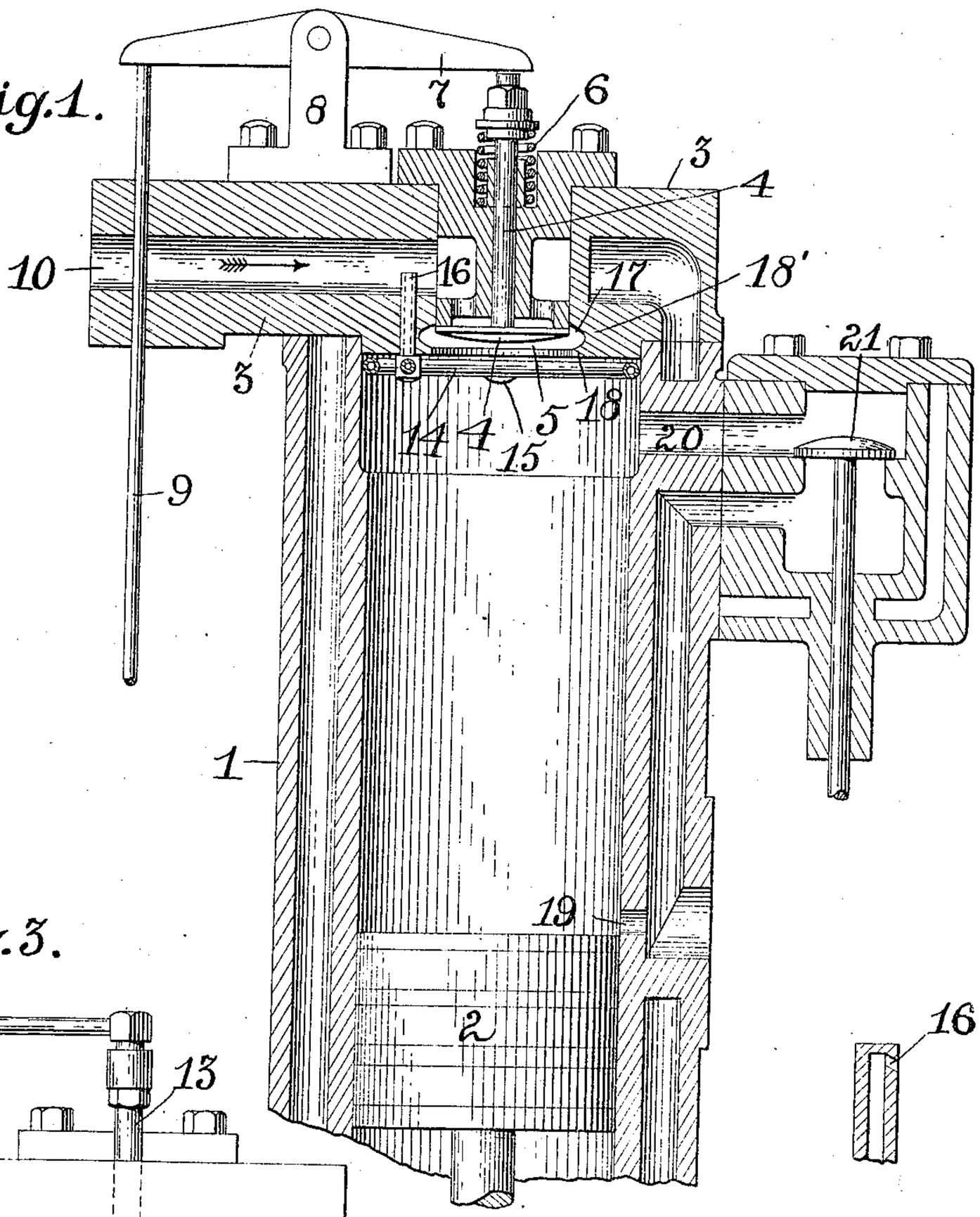



*Fig. 3.*

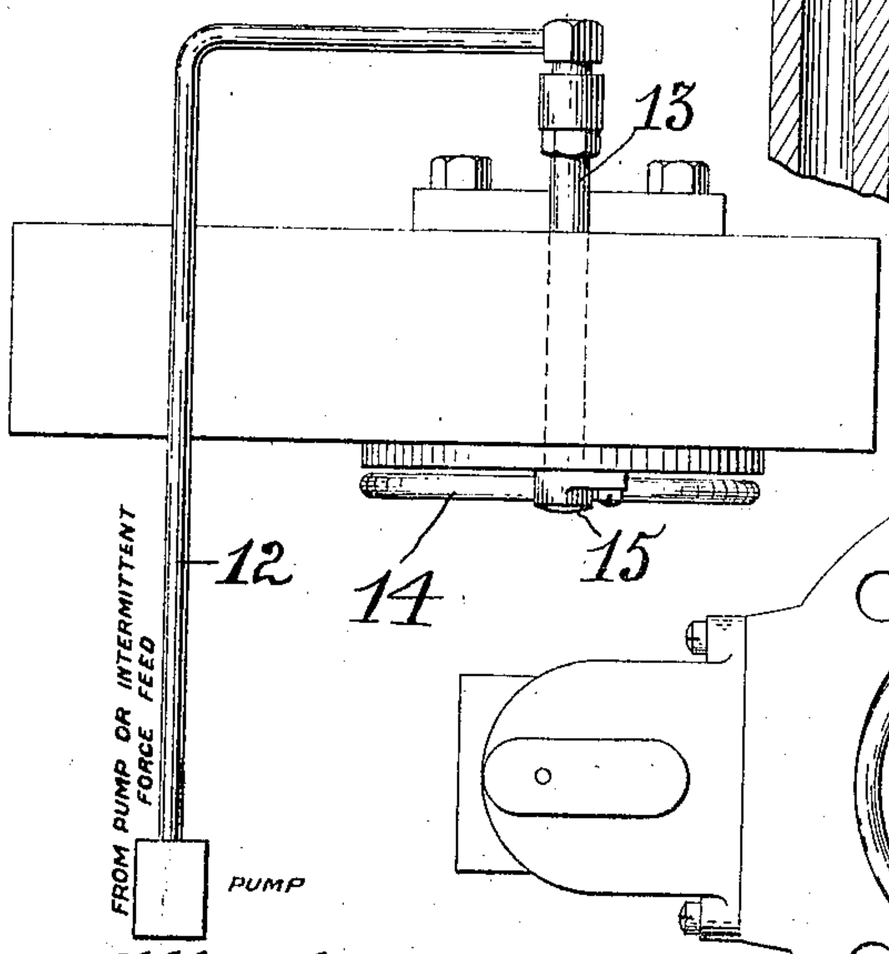
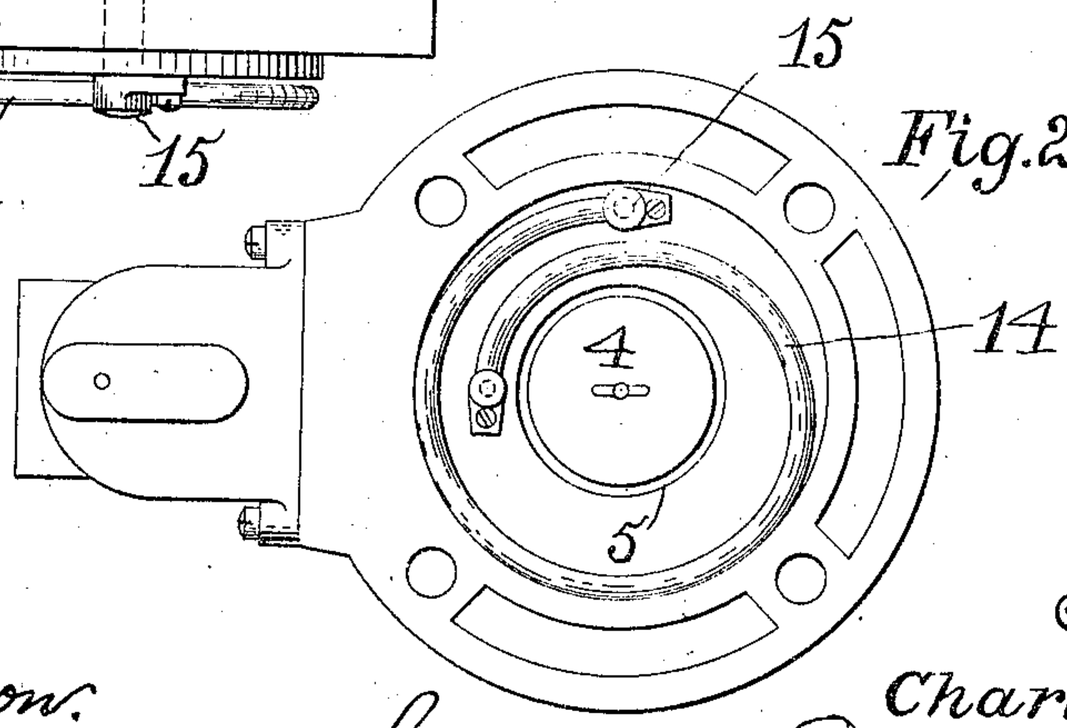






*Fig. 2.*




Attest:

Edwd. C. Tolson.

Benth. Stahl.

Inventor:

Charles White,

By Spear, Middleton, Donaldson & Spear

Attys.

# UNITED STATES PATENT OFFICE.

CHARLES WHITE, OF BALTIMORE, MARYLAND.

## METHOD OF OPERATING GAS-ENGINES AND APPARATUS THEREFOR.

975,008. Specification of Letters Patent. Patented Nov. 8, 1910.

Application filed June 24, 1909, Serial No. 504,129. Renewed May 11, 1910. Serial No. 560,728.

*To all whom it may concern:*

Be it known that I, CHARLES WHITE, citizen of the United States, residing at Baltimore, Maryland, have invented certain new and useful Improvements in Methods of Operating Gas-Engines and Apparatus Therefor, of which the following is a specification.

My invention relates to gas engines, and is applicable to either the four-cycle or the two-cycle type, and concerns particularly a method of operating, and the means by which heavy oil may be employed as the fuel.

In the accompanying drawings:—Figure 1 is a sectional view of a portion of a gas engine cylinder showing its piston, its induction valve, exhaust valve, and the vaporizing coil and other parts constituting my invention in place in connection with the cylinder head; Fig. 2 is a bottom plan view of the cylinder head with my invention in place; Fig. 3 is a side elevation of the cylinder head with my invention attached thereto.

In providing means for carrying out my improved method, I employ a cylinder 1 of substantially ordinary type, 2 indicating the piston thereof and 3 the cylinder head of substantially ordinary form.

The induction valve is shown at 4, and while this is of substantially known form, I arrange it in a recess or countersink 5 formed on the under side of the cylinder head so that the valve is located at a slight distance above the lower face of the said head. The valve may be operated to open the induction port against the pressure of its spring 6 by any suitable means, such as by a lever 7 pivoted to a standard 8 on the cylinder head, and operated automatically through a rod 9 from means connected and working in unison with the engine.

The air inlet port is indicated at 10, leading to a point above the induction valve, which is guided in a housing 11 of substantially known form.

The fuel is fed through a pipe 12 to the upper end 13 of an oil heating tube or coil 14 located within the combustion chamber, and at a slight distance away from the inner wall of the cylinder, the connecting portion 13 extending down through the cylinder head to its point of connection at 15 with the oil heater. The outlet pipe for the oil heating tube extends from the opposite end of said tube up through the cylinder head and terminating at a point above the plane of and close to the induction valve, the upper end of the said discharge pipe being located in the air inlet port or passage 10. The outlet opening 16 from the discharge pipe is directed laterally from said pipe and downwardly, so that the fuel will be directed to a point immediately above the induction valve. It will be seen from this construction that the oil heating coil will be subjected to the heat generated by the explosions, and a charge of oil being fed into this highly heated coil, will be immediately heated to a high degree, and as soon as the induction valve is opened, the highly heated oil will be drawn from or discharged through the port 16 at a point close to and approximately immediately above the induction valve, and will immediately flash into vapor to pass through the induction port into the cylinder, together with the air passing inwardly through the passage 10. I feed the oil to the vaporizer tube in charges regulated in volume or quantity to the size of the engine and to its speed, and for this purpose I prefer to employ a force feed device consisting of a pump connected to and operated from a moving part of the engine, which delivers a measured quantity of oil, for instance, about fifteen drops, this varying, of course, with the size of the engine. I do not, however, limit myself in this respect, as the oil may be fed in other ways and by other means than those described.

By my invention the vapor is drawn through the induction valve from a point close thereto, so that the vapor will not have a chance to cool and condense after the oil which leaves the discharge port 16, flashes into vapor, for it will be observed that the proximity of the end of the discharge pipe and the port 16 to the highly heated induction valve will serve to keep this discharge end of the tube heated, and thus condensation and cooling of the fuel will be prevented.

It will be observed that the chamber 5 or the counterbore is made with inclined walls at 17 which are merged into inclined walls at 18 by a curved connecting portion or wall at 18′, thus forming a chamber the walls of which are inclined and contracted inwardly. By this construction, the fuel mixture passing from the edge of the induction valve

strikes the inclined walls at 18, and is deflected inwardly toward the axial line of the cylinder, where, meeting the mixture deflected from the opposite points of the inclined deflecting wall, a complete mixture will result, and a column of the mixture will be delivered axially of the cylinder so as to strike upon the central portion of the highly heated piston instead of being deflected laterally from the edge of the induction valve against the cooper walls of the cylinder. In this way, the highly heated vapor is prevented from being cooled and condensed against the walls of the cylinder, and is directed centrally thereof so as to strike upon the central portion of the heated piston.

The main exhaust port is indicated at 19, and the supplementary exhaust at 20 and the exhaust valve at 21. As the piston is propelled downwardly or outwardly as a result of the explosion, it uncovers the main exhaust port 19 at the end of its stroke, and the exhaust gases sweep across the upper face of the piston out through the main exhaust port 19, and thus keep this upper face clear from sediment or collection of residuum from the exploded gases. This is an important feature in connnection with gas engines designed to operate with heavy oils.

I do not limit myself to a coil as the oil heating means.

The capacity of the heating coil in a ten horse-power engine is about fifteen drops for each charge, and such charge completely fills the coil. The inlet opening to the coil is about one-sixteenth of an inch in diameter while the outlet is restricted, being about one thirty-second of an inch in diameter.

In carrying out my improved method, charges of heavy oil are fed to the heating coil to fill the same, and be highly heated thereby to a degree at or above the point of vaporization and while held in confinement. On the suction stroke when the induction valve is opened, the highly heated oil in the coil is caused to be discharged therefrom, and as soon as its release from confinement takes place, the oil immediately flashes into vapor at the induction valve, and passes into the cylinder mixed with the air passing through the port or passage 10. The discharge of the highly heated oil through the restricted outlet of the heating coil is due to the heated charge being forced out by the fresh cold charge forced by the pump or other means into the heating coil, and acting as a liquid piston.

In controlling the engine, if the governor cuts out, it leaves the charge of oil in the coil to remain there until forced out by the next incoming charge.

I claim:—

1. The herein described method of operating a gas engine consisting in heating a single confined charge of oil by the heat generated by the explosion within the cylinder, delivering said highly heated charge of oil and releasing it from restraint on the exterior of and adjacent the induction valve to flash into vapor and to pass through the open induction valve with air into the cylinder.

2. The herein described method of operating a gas engine consisting in heating a single confined charge of oil by the heat generated by the explosion within the cylinder forcing the highly heated charge of oil to the point of delivery by the incoming fresh charge and releasing it from restraint on the exterior of and adjacent to the induction valve to flash into vapor and to pass through the open valve with air into the cylinder, substantially as described.

3. In a petroleum engine, the combination of a cylinder and piston, an oil heater of a capacity to be completely filled by a charge of oil, and arranged to be heated by the explosion within the cylinder, and having a restricted outlet adjacent the induction valve, and means for forcing measured charges of oil to said heater, substantially as described.

4. The herein described method of operating a gas engine consisting in heating a single confined charge of oil, forcing the highly heated charge of oil to the point of delivery by the incoming fresh charge and releasing it from restraint on the exterior of and adjacent to the induction valve to flash into vapor and to pass through the open valve with air into the cylinder, substantially as described.

5. The herein described method of operating a gas engine consisting in heating a single confined charge of oil, forcing the highly heated oil to the point of delivery by the incoming fresh charge and releasing it from restraint in any suitable place outside the explosion chamber so the flash into vapor will be mixed with the incoming air into the cylinder, substantially as described.

In testimony whereof, I affix my signature in presence of two witnesses.

CHARLES WHITE.

Witnesses:
SAMUEL HOLTZ,
THOMAS W. ELLIS.